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RECENT CHANGES IN UPPER AIR ANALYSIS PROCEDURES.(U)
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RECENT CHANGES IN UPPER AIR ANALYSIS PROCEDURES

Fleet Numerical Weather Facility
Monterey, California

Technical Memo. No. 12

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By

LCDR George E. Lawniczak, Jr., USN

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1. Introduction

Several recent changes in techniques of upper air analysis have been made and should be brought to the attention of all users for operational evaluation.

The changes involve vorticity recomputation after each pass, different formulation of the 500-mb guess field, several different wind application techniques and analysis of 200-mb temperature data.

2. Vorticity

In the application of relaxation methods in Carstensen's analysis, the laplacian of the guess field is preserved while fitting new data. Previously the vorticity was computed upon entry into the analysis subroutine and this field was used throughout subsequent passes. The present version recomputes the laplacian upon completion of each analysis pass. The change results in the forecast exercising less influence in data areas on succeeding passes.

3. 500-mb Guess

In the early days of upper air analysis, the guess for the analysis of 500-mb data was a mathematical buildup or a verifying forecast. When the thickness forecast became a part of the Barotropic model, the average of the 500-mb forecast and a 500 mb formed by adding the thickness forecast to an on-time surface analysis, converted

to a 1000-mb height field, was used. This technique was useful in adding relevant surface information but the advected thickness forecast was rather inelegant.

The present procedure is to subtract the surface forecast from the verifying analysis, convert to meters, divide by two and add to the verifying 500-mb forecast. The inputs in either of the latter two systems give an identical relationship. The advected forecast thickness is merely replaced by the thickness between the 500-mb forecast and the surface forecast.

4. Application of Winds

In the mass-structure model once the 500-mb winds have been introduced to delineate the mean temperature of the troposphere, all relevant information (within the troposphere) of the vertical wind structure has been incorporated. (The 200-mb winds are inserted for subtropical jet delineation and stratospheric control.)

Previous procedures checked for close reports before extrapolation of the four surrounding height values was made. The close report could be an airep or raob. Obviously station ships and dense land areas were affected. (The idea is not to extrapolate any closer than half the distance to the nearest report.)

Several changes have been made in this area. The close report must have a height value and a wind. The station must be located

north of 31° N. If the station is south, an automatic extrapolation of 762 km (each direction) parallel to the wind and 381 km normal to the wind is made. At the 200-mb level, these values are 1143 km and 571 km. In computing the normal heights, the sine of 15° is used for stations south of 15° N.

5. Temperatures

Since FNWF produced temperatures are hydrostatically deduced, the resulting fields are virtual in nature. The differences between observed and analyzed will be pronounced at low levels in the tropics but should not be more than 3° . Since the 200-mb height analysis is the result of an adjunct layer in the basic mass-structure model, 200-mb temperatures can be expected to differ in some areas. Therefore analysis of reported 200-mb temperatures is made using the hydrostatic field as the guess. A difference of 7 degrees is allowed. If the report differs by more than 7 from the guess, it is rejected.

Customers of FNWF products are invited to relay all queries, discrepancies, etc., to FNWF for evaluation. Only in this way can continued improvement in analysis techniques be achieved.